MODINE

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INSTALLATION AND SERVICE MANUAL
separated combustion gas-fired unit heaters
model HDS and HDC

All models approved for use in California by the CEC and in Massachusetts. Unit heater is certified for residential and commercial applications.

⚠ WARNING

1. **Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death, and could cause exposure to substances which have been determined by various state agencies to cause cancer, birth defects or other reproductive harm. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.**
2. **Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion, which can cause property damage, serious injury, or death.**

FOR YOUR SAFETY

WHAT TO DO IF YOU SMELL GAS:

1. **Open windows.**
2. **Do not try to light any appliance.**
3. **Do not touch any electrical switch; do not use any phone in your building.**
4. **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you can not reach your gas supplier, call your fire department.**

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

IMPORTANT

The use of this manual is specifically intended for a qualified installation and service agency. All installation and service of these units must be performed by a qualified installation and service agency.

Inspection on Arrival

1. Inspect unit upon arrival. In case of damage, report it immediately to transportation company and your local Modine sales representative.
2. Check rating plate on unit to verify that power supply meets available electric power at the point of installation.
3. Inspect unit upon arrival for conformance with description of product ordered (including specifications where applicable).

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THIS MANUAL IS THE PROPERTY OF THE OWNER.
PLEASE BE SURE TO LEAVE IT WITH THE OWNER WHEN YOU LEAVE THE JOB.

SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS

THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PROVIDE SAFE, EFFICIENT AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY DAMAGE OR LOSS, PERSONAL INJURY, OR DEATH. THESE INSTRUCTIONS SUBJECT TO ANY MORE RESTRICTIVE LOCAL OR NATIONAL CODES.

HAZARD INTENSITY LEVELS

1. **DANGER:** Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
2. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
3. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

⚠ DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

⚠ WARNING

1. Gas fired heating equipment must be vented - do not operate unvented.
2. A built-in power exhauster is provided - additional external power exhausters are not required or permitted.
3. If an existing heater is being replaced, it may be necessary to resize the venting systems. Improperly sized venting systems can result in vent gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 (NFPA 54) or CSA B149.1 latest edition. Failure to follow these instructions can result in injury or death.
4. Under no circumstances should two sections of double wall vent pipe be joined together within one horizontal vent system due to the inability to verify complete seal of inner pipes.
5. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
6. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).
7. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input, or 5% below the minimum rated input of dual rated units.
8. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
9. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
10. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
11. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than the rated voltage.
12. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacements parts list may be obtained by contacting the factory. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owners risk.

⚠ CAUTION

1. All literature shipped with this unit should be kept for future use for servicing or service diagnostics. Do not discard any literature shipped with this unit.
2. Consult piping, electrical, and venting instructions in this manual before final installation.
3. Do not attach ductwork, air filters, or polytubes to any propeller unit heater.
4. Clearances to combustible materials are critical. Be sure to follow all listed requirements.
5. Low profile heaters are designed for use in heating applications with ambient startup temperatures between -40°F and 90°F, and ambient operating temperatures between 40°F and 90°F.
6. Do not install unit outdoors.
7. In garages or other sections of aircraft hangars such as offices and shops that communicate with areas used for servicing or storage, keep the bottom of the unit at least 7' above the floor unless the unit is properly guarded to provide user protection from moving parts. In parking garages, the unit must be installed in accordance with the standard for parking structures ANSI/NFPA 88A latest edition, and in repair garages the standard for repair garages NFPA 30A - latest edition (Formerly NFPA 88B). In Canada, installation of heaters in airplane hangars must be in accordance with the requirements of the enforcing authority, and in public garages in accordance with the current CSA-B149 codes.
8. In aircraft hangars, keep the bottom of the unit at least 10' from the highest surface of the wings or engine enclosure of the highest aircraft housed in the hangars and in accordance with the requirements of the enforcing authority and/or NFPA 409-latest edition.
9. Installation of units in high humidity or salt water atmospheres will cause accelerated corrosion resulting in a reduction of the normal life of the units.
10. Do not install units below 7' measured from the bottom of the unit to the floor in commercial applications (unless unit is properly guarded to provide user protection from moving parts) and 5' measured from the bottom of the unit to the floor in residential applications.
11. Be sure no obstructions block air intake and discharge of unit heaters.
12. The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the top of the unit may be required to be greater then the minimum specified if heat damage, other than fire, may occur to materials above the unit heater at the temperature described.
13. Allow 18" of clearance at rear (or 6" beyond end of motor at rear of unit, whichever is greater) and access side to provide ample air for proper operation of fan.
14. Installation must conform with local building codes or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - latest edition. In Canada installation must be in accordance with CSA-B149.1.
15. The concentric vent adapter box must be installed inside of the structure or building. Do not install this box on the exterior of a building or structure.
16. Purging of air from gas supply line should be performed as described in the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - latest edition, or, or in Canada in CSA-B149 codes.
17. When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).

SPECIAL PRECAUTIONS / SI (METRIC) CONVERSION FACTORS

⚠ CAUTION

18. The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve. This manual shut-off valve should be located within 6' of the heater.
19. Turn off all gas before installing appliance.
20. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.
21. Check the gas inlet pressure at the unit upstream of the combination gas control. The inlet pressure should be 6-7" W.C. on natural gas or 12-14" W.C. on propane. If inlet pressure is too high, install an additional pressure regulator upstream of the combination gas control.
22. Service or repair of this equipment must be performed by a qualified service agency.
23. Do not attempt to reuse any mechanical or electronic ignition controllers which has been wet. Replace defective controller.

IMPORTANT

1. To prevent premature heat exchanger failure, do not locate ANY gas-fired appliances in areas where corrosive vapors (i.e. chlorinated, halogenated or acid) are present in the atmosphere.
2. To prevent premature heat exchanger failure, the input to the appliance as indicated on the serial plate, must not exceed the rated input by more then 5%.
3. To prevent premature heat exchanger failure, observe heat exchanger tubes. If the tubes become red while blower and furnace are in operation, check to be sure the blower has been set to the proper rpm for the application. Refer to page 13 for Blower Adjustments.
4. Start-up and adjustment procedures must be performed by a qualified service agency.

To check most of the Possible Remedies in the trouble-shooting guide listed in Table 17.1, refer to the applicable sections of the manual.

SI (METRIC) CONVERSION FACTORS

To Convert	Multiply By	To Obtain
"W.C.	0.249	kPa
°F	(°F-32) x 5/9	°C
Btu	1.06	kJ
Btu/ft^3	37.3	kJ/m^3
Btu/hr	0.000293	kW
CFH (ft^3/hr)	0.000472	m^3/min
CFH (ft^3/hr)	0.00000787	m^3/s
CFM (ft^3/min)	0.0283	m^3/min
CFM (ft^3/min)	0.000472	m^3/s

To Convert	Multiply By	To Obtain
feet	0.305	m
Gal/Hr.	0.00379	m^3/hr
Gal/Hr.	3.79	l/hr
gallons	3.79	l
Horsepower	746	W
inches	25.4	mm
pound	0.454	kg
psig	6.89	kPa
psig	27.7	"W.C.

BEFORE YOU BEGIN

⚠ CAUTION

1. All literature shipped with this unit should be kept for future use for servicing or service diagnostics. Leave manual with the owner. Do not discard any literature shipped with this unit.
2. Consult piping, electrical, and venting instructions in this manual before final installation.
3. Do not attach ductwork, air filters, or polytubes to any propeller unit heater.

In the U.S., the installation of these units must comply with the National Fuel Gas Code, ANSI Z223.1 - latest edition (NFPA 54) and other applicable local building codes. In Canada, the installation of these units must comply with local plumbing or waste water codes and other applicable codes and with the current code CSA-B149.1.

1. All installation and service of these units must be performed by a qualified installation and service agency only as defined in ANSI Z223.1, latest edition or in Canada by a licensed gas fitter.
2. This unit is certified with the controls furnished. For replacements parts, please order according to the replacement parts list on serial plate. Always know your model and serial numbers. The right is reserved to substitute other authorized controls as replacements.
3. Unit is balanced for correct performance. Do not alter fan or operate motors at speeds below what is shown in this manual.
4. Information on controls is supplied separately.
5. The same burner is used for natural and propane gas.

UNIT LOCATION

⚠ DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

⚠ CAUTION

1. Clearances to combustible materials are critical. Be sure to follow all listed requirements.
2. Low profile heaters are designed for use in heating applications with ambient startup temperatures between -40°F and 90°F, and ambient operating temperatures between 40°F and 90°F.
3. Do not install unit outdoors.
4. In garages or other sections of aircraft hangars such as offices and shops that communicate with areas used for servicing or storage, keep the bottom of the unit at least 7' above the floor unless the unit is properly guarded. In parking garages, the unit must be installed in accordance with the standard for parking structures ANSI/NFPA 88A-latest edition, and in repair garages the standard for repair garages NFPA 30A - latest edition (Formerly NFPA 88B). In Canada, installation of heaters in airplane hangars must be in accordance with the requirements of the enforcing authority, and in public garages in accordance with the current CSA-B149 codes.
5. In aircraft hangars, keep the bottom of the unit at least 10' from the highest surface of the wings or engine enclosure of the highest aircraft housed in the hangars and in accordance with the requirements of the enforcing authority and/or NFPA 409-latest edition.
6. Installation of units in high humidity or salt water atmospheres will cause accelerated corrosion resulting in a reduction of the normal life of the units.

IMPORTANT

To prevent premature heat exchanger failure, do not locate ANY gas-fired appliances in areas where corrosive vapors (i.e. chlorinated, halogenated or acid) are present in the atmosphere.

Location Recommendations

1. When locating the heater, consider general space and heating requirements, availability of gas and electrical supply, and proximity to vent locations.
2. When locating units, it is important to consider that the combustion air and exhaust vent piping must be connected to the outside atmosphere. Vent terminals should be located adjacent to one another. Maximum equivalent vent lengths are listed in “Section A - General Instruction - All Units” of the Venting instructions.
3. Be sure the structural support at the unit location site is adequate to support the unit's weight. For proper operation the unit must be installed in a level horizontal position.
4. Do not install units in locations where the flue products can be drawn into the adjacent building openings such as windows, fresh air intakes, etc.
5. Be sure that the minimum clearances to combustible materials and recommended service clearances are maintained. Units are designed for installation with the minimum clearances as shown in Table 4.1.

Table 4.1 - Clearances

Unit Side	Clearance To Combustible Materials	Recommended Service Clearance
Top and Bottom	1"	1"
Access Side	1"	18"
Non-Access Side	1"	1"
Rear	18"	18"
Vent Connector	4"	4"

6. Do not install units in locations where gas ignition system is exposed to water spray, rain, or dripping water.
7. Mounting Height (measured from bottom of unit) at which unit heaters are installed is critical. Refer to mounting height and heat throw data on page 16 of this manual. The maximum mounting height for any unit is that height above which the unit will not deliver heated air to the floor.

Turning The Unit 180° (Model Sizes 30-75 Only)

All units are produced at the factory with left-side controls (when looking at the unit). If the installation requires the controls to be on the right side, all HDS/HDC heaters - with the exception of the 100 and 125 - can be turned-over by following the instructions below.

- By turning the unit 180° from the way it was received from the factory, the sides become opposite but the front and back remain in the same relative position. The bottom panel now becomes the top panel and vice-versa.
- Remove the access panel, turn it 180°, and re-attach it to the unit so that all the information labels can be read.
- Remove the spring loaded deflector blades, turn them over, replace, and adjust so they are open and in a position to direct the heated air down to the floor.

UNIT MOUNTING

⚠ CAUTION

1. Do not install units below 7' measured from the bottom of the unit to the floor in commercial applications (unless unit is properly guarded to provide user protection from moving parts) and 5' measured from the bottom of the unit to the floor in residential applications.
2. Be sure no obstructions block air intake and discharge of unit heaters.
3. The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the top of the unit may be required to be greater than the minimum specified if heat damage, other than fire, may occur to materials above the unit heater at the temperature described.
4. Allow 18" clearance at rear (or 6" beyond end of motor at rear of unit, whichever is greater) and access side to provide ample air for proper operation of fan.

1. Be sure the means of suspension is adequate to support the weight of the unit (see page 16 for unit weights).
2. For proper operation, the unit must be installed in a level horizontal position.
3. Clearances to combustibles as previously specified must be strictly maintained.
4. For model sizes 30-75, before lifting the heater for suspension, the mounting brackets must be installed as follows (for bracket accessory installation on model sizes 100-125, see the latest revision of literature 6-594):
   - For standard (left side) control access, remove the (3) screws and mounting bracket along the top edge of both the front and back of the unit. Install the front bracket as shown in Figure 5.1 by aligning the screw holes on the bracket with the screw holes on the top edge of the unit. Repeat for the bracket on the back of the unit.
   - For right side control access, remove the (3) screws and mounting bracket along the top edge of both the front and back of the unit. Turn the unit over and install the front bracket as shown in Figure 5.2 by aligning the screw holes on the bracket with the screw holes on the top edge of the unit (originally the bottom edge). Repeat for the bracket on the back of the unit.

5a. **Suspension by screws/lag bolts:** Secure the mounting brackets to the ceiling joists or truss, using 1/4" screws with 1/2" washers. These unit mounting brackets are slotted to accommodate joists on 16" or 24" centerlines. See page 16 for mounting bracket dimensions.

Figure 5.1 - Unit Heater in Standard Mounting Configuration (30-75 Units Only)

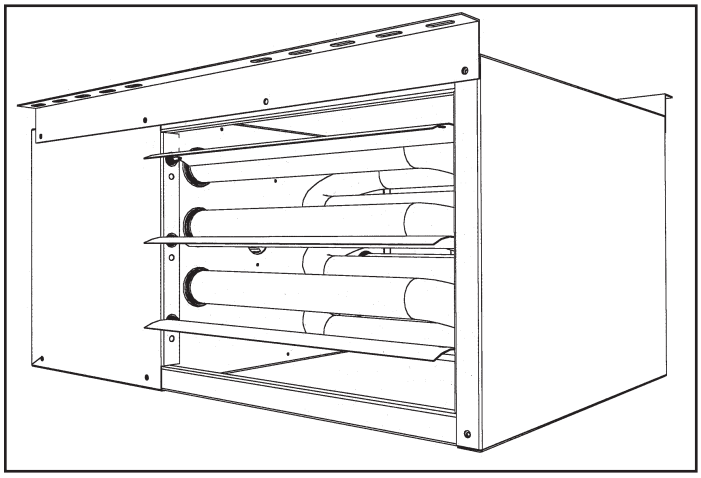
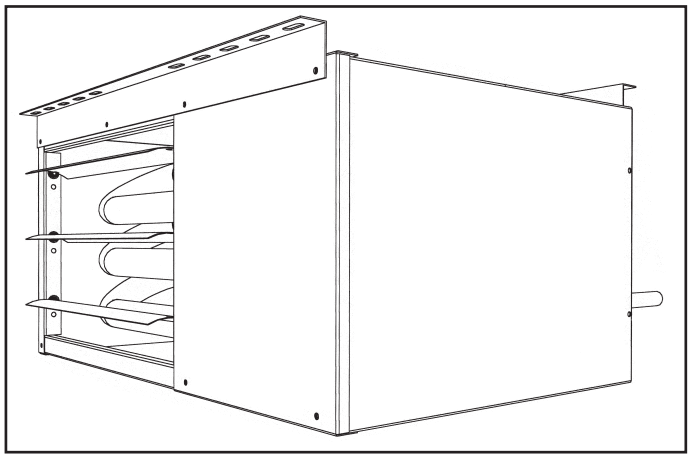


Figure 5.2 - Unit Heater Turned 180° (30-75 units only) (Access panel and heated air outlet change sides)

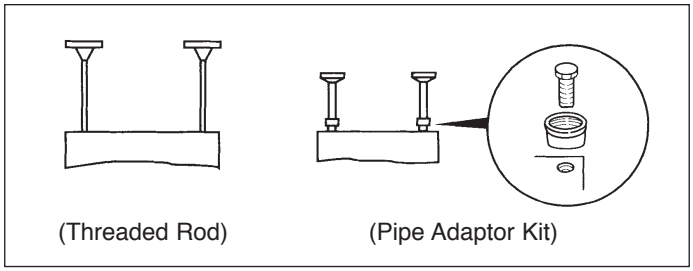


5b. **Suspension by threaded rod:** The unit can also be hung with threaded rod utilizing the same mounting brackets. Attach the threaded rod to the unit mounting brackets, securing with a top and bottom nut. For model sizes 100-125, the units are designed to be suspended by threaded rod without the use of brackets. On each piece of 3/8" threaded rod used, screw a nut a distance of about one inch onto the end of the threaded rods that will be screwed into the unit heater. Place a washer over the end of the threaded rod and screw the threaded rod into the unit heater weld nuts on the top of the heater at least 5 turns, and no more than 10 turns. Tighten the nut first installed onto the threaded rod to prevent the rod from turning.

Next, drill holes into a steel channel or angle iron at the same centerline dimensions as those chosen for the heater being installed. The steel channels or angle iron pieces need to span and be fastened to appropriate structural members. Cut the threaded rods to the preferred length, push them through the holes in the steel channel or angle iron and secure with washers and lock nuts, lock washers and nuts, or a washer with double nut arrangement.
NOTE: A pipe hanger adapter kit, shown in Figure 5.3, is available as an accessory. One kit consists of two drilled 3/4" IPS pipe caps and two 3/8" - 16 x 1-3/4" capscrews to facilitate threaded pipe suspension. Two kits would be required.

5c. **Shelf mounted units:** The unit heater can also be installed on a shelf. The mounting brackets will need to be attached to the heater the same manner as explained in note #4, however, to mount on a shelf the brackets must go on the bottom of the heater. The brackets must be affixed to the shelf using similar screws (1/4" screw with 1/2" washer) as overhead joist or truss mounting. Be sure all clearance to combustible requirements are met.

Figure 5.3 - Unit Heater Suspension Methods



INSTALLATION - VENTING

⚠ WARNING

1. Gas fired heating equipment must be vented - do not operate unvented.
2. A built-in power exhauster is provided - additional external power exhausters are not required or permitted.
3. If an existing heater is being replaced, it may be necessary to resize the venting systems. Improperly sized venting systems can result in vent gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 (NFPA 54) or CSA-B149.1 Installation Code - latest edition. Failure to follow these instructions can result in serious injury or death.
4. Under no circumstances should two sections of double wall vent pipe be joined together within one horizontal vent system due to the inability to verify complete seal of inner pipes.

⚠ CAUTION

Installation must conform with local building codes or in the absence of local codes, with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - latest edition. In Canada installation must be in accordance with CSA B149.1.

Model HDS/HDC unit heaters must be vented with the proper passageway as described in these instructions to convey flue gases from the unit or the vent connector to the outside atmosphere. The heaters must also have a separate combustion air intake pipe to bring in fresh air for combustion from the outside atmosphere.

The venting instructions are organized in sections, based on installation type. The sections are identified as follows:

Instructions Section	Applicable Installation Instructions by Vent System Type
A	General instructions for **ALL** installations
B	**VERTICAL 2-PIPE** vent systems ①
C	**HORIZONTAL 2-PIPE** vent systems ①
D	**HORIZONTAL AND VERTICAL CONCENTRIC** vent systems ①

① The differences between Vertical and Horizontal vent systems in 2-Pipe or Concentric Vent configurations will be identified in "Section A - General Instructions – All Units".

Section A – General Instructions – All Units

A1. If the unit heater being installed is replacing existing equipment and using the existing vent system from that equipment, inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code ANSI Z223.1 or CSA B149.1 Installation Code-latest edition and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies, which could cause an unsafe condition.

A2. The combustion air pipe and vent pipe should be galvanized steel or other suitable corrosion resistant material. Follow the National Fuel Gas Code for minimum thickness of vent material. The minimum thickness for connectors varies depending on the pipe diameter. Do not vent unit with PVC or other forms of plastic venting material.

A3. All heaters come with factory installed vent and combustion air adapters for attaching the vent pipe to the heater. Attach the vent pipe to the adapter with 3 corrosion resistant screws. (Drill pilot holes through the vent pipe and adapter prior to screwing in place). Vent pipe must not be smaller than the connector size.

A4. Refer to Table 6.1 for total equivalent vent pipe lengths, making the vent system as straight as possible. Refer to Table 6.1 for total equivalent vent pipe lengths, making the vent system as straight as possible.

Table 6.1 - Vent Pipe Diameters, Transitions, and Total Equivalent Vent Pipe Lengths For Horizontal and Vertical Venting Systems

Model Size	Vent Transition Included	Vent Pipe Sizes	Minimum Eqv. Length	Maximum Eqv. Length
30-45	**3" to 4"**	3"	3'	25'
60-125	**Not Required**	4"	3'	25'

A5. A minimum of 12" straight pipe is recommended from the flue outlet before turns in the vent pipe.

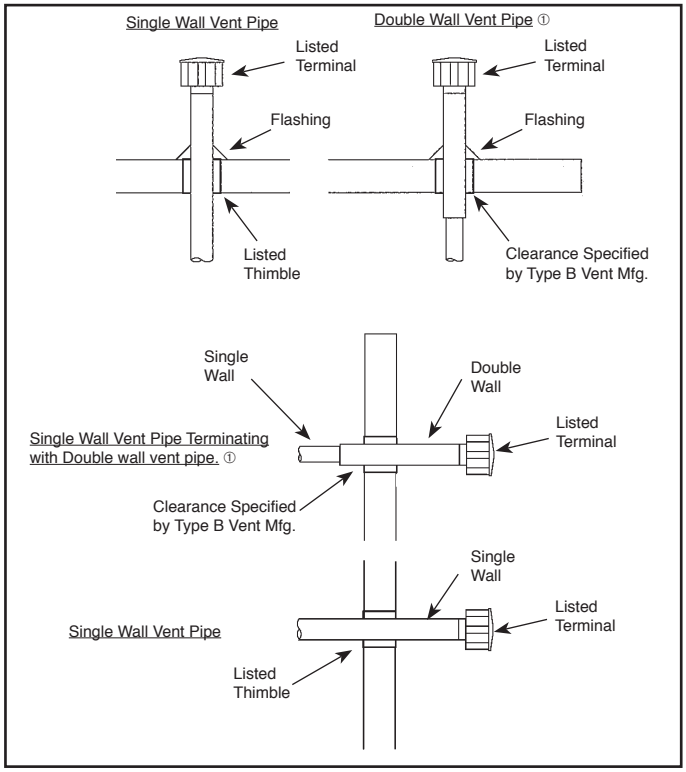
A6. Horizontal sections of vent pipe are to be installed with a minimum downward slope from the appliance of 1/4 inch per foot and suspended securely from overhead structures at points not greater than 3' apart.

A7. Fasten individual lengths of vent together with at least three corrosion resistant sheet metal screws.

A8. Keep single wall vent pipe at least 6" from combustible materials. For double wall vent pipe, follow the vent pipe manufacturer's clearances to combustibles. The minimum distance from combustible materials is based on the combustible material surface not exceeding 160°F. Clearance from the vent pipe (or the top of the unit) may be required to be greater than 6" if heat damage other than fire could result (such as material distortion or discoloration).

A9. Avoid venting through unheated space when possible. When venting does pass through an unheated space or if the unit is installed in an environment that promotes condensation, insulate runs greater than 5' to minimize condensation. Inspect for leakage prior to insulating and use insulation that is noncombustible with a rating of not

Figure 6.1 - Venting Through Combustible Roof or Wall



① See Instruction A12 for attaching single wall pipe to double wall pipe

less than 400°F. Install a tee fitting at the low point of the vent system and provide a drip leg with a clean out cap as shown in Figure 8.1.

A10. When the vent passes through a combustible INTERIOR wall or floor, a metal thimble 4" greater than the vent diameter is necessary. If there is 6' or more of vent pipe in the open space between the appliance and where the vent pipe passes through the wall or floor, the thimble need only be 2" greater than the diameter of the vent pipe. If a thimble is not used, all combustible material must be cut away to provide 6" of clearance. Where authorities have jurisdiction type B vent may be used for the last section of vent pipe to maintain clearance to combustibles while passing through wall or floor. See Figure 6.1. Any material used to close the opening must be noncombustible.

A11. All seams and joints of the single wall pipe must be sealed with metallic tape or silastic suitable for temperatures up to 400°F. Wrap the tape two full turns around the vent pipe. One continuous section of double wall vent pipe may be used within the vent system to pass through the wall to a listed vent cap. Refer to instruction A12 in "Section A – General Instructions – All Units" for attaching double wall pipe to single wall pipe.

A12. The following are General Instructions for Double Wall (Type B) Terminal Pipe Installation:

How to attach a single wall vent terminal to double wall (type B) vent pipe:

1. Look for the "flow" arrow on the vent pipe.
2. Slide the vent terminal inside the exhaust end of the double wall vent pipe.
3. Drill (3) holes through the pipe and the vent terminal. Using 3/4" long sheet metal screws, attach the cap to the pipe. Do not over tighten.

How to connect a single wall vent system to a double wall (type B) vent pipe:

1. Slide the single wall pipe inside the inner wall of the double wall pipe.
2. Drill (3) holes through both walls of the single and double wall vent pipes. Using 3/4" sheet metal screws, attach the two pieces of pipe. Do not over tighten.
3. The gap between the single and double wall pipe must be sealed but it is not necessary to fill the full volume of the annular area. To seal, run a large bead of 400°F silastic around the gap.

A13. Vent termination clearances must be maintained:

Table 7.1 - Vent Termination Clearances

Structure	Minimum Clearances for Vent Terminal Location
Forced air inlet within 10 feet	3 feet above
Combustion air inlet of another appliance	6 feet all directions
Door, window, gravity air inlet, or any building opening	4 feet horizontal and below 1 foot above
Electric meter, gas meter, gas regulator, and relief equipment ①	4 feet horizontal (U.S.) 6 feet horizontal (Canada)
Gas regulator ①	3 feet horizontal (U.S.) 6 feet horizontal (Canada)
Adjoining building or parapet wall	6 feet all directions
Adjacent public walkways	7 feet all directions
Grade (ground level)	3 feet above ②

① Do not terminate the vent directly above a gas meter or regulator.

② The vent must be at least 6" higher than anticipated snow depth.

A14. Do NOT vent this appliance into a masonry chimney.

A15. Do NOT use dampers or other devices in the vent or combustion air pipes.

A16. The venting system must be exclusive to a single appliance, and no other appliance is allowed to be vented into it.

A17. Precautions must be taken to prevent degradation of building materials by flue products.

A18. Single wall vent pipe must not pass through any unoccupied attic, inside wall, concealed space, or floor.

A19. Uninsulated single wall vent pipe must not be used outdoors for venting appliances in regions where the 99% winter design temperature is below 32°F.A19. Long runs of horizontal or vertical combustion air pipes may require insulation in very cold climates to prevent the buildup of condensation on the outside of the pipe where the pipe passes through conditioned spaces.

A20. Vertical combustion air pipes should be fitted with a tee with a drip leg and a clean out cap to prevent against the possibility of any moisture in the combustion air pipe from entering the unit. The drip leg should be inspected and cleaned out periodically during the heating season.

A21. The vent terminal must be:

Table 7.2 - Vent Terminals

Model Size	Modine PN	Other Listed Terminals
30-75	5H0722850005	Gary Steel 1092
100-125	5H0722850001	Gary Steel 1092

A22. In addition to following these General Instructions, specific instructions for Vertical and Horizontal vent systems in 2-Pipe or Concentric Vent configurations must also be followed. The following outlines the differences:

Vertical Vent System Determination

- Vertical vent systems terminate vertically (up) (an example is shown in Figure 8.1).
- Determine the venting configuration as follows:

  > For two building penetrations through the wall or roof (one for the combustion air inlet pipe and one for the vent pipe), proceed to "Section B - Vertical 2-Pipe Venting".

  > For a single larger building penetration through the wall or roof, through which both the combustion air inlet and vent pipes will pass, proceed to "Section D - Horizontal and Vertical Concentric Venting".

  > For all other cases, proceed to the next section for Horizontal Vent System Determination.

Horizontal Vent System Determination

- Horizontal vent systems terminate horizontally (sideways) (an example is shown in Figure 9.1).
- Determine the venting configuration as follows:

  > For two building penetrations through the wall or roof (one for the combustion air inlet pipe and one for the vent pipe), proceed to "Section C - Horizontal 2-Pipe Venting".

  > For a single larger building penetration through the wall or roof, through which both the combustion air inlet and vent pipes will pass, proceed to "Section D - Horizontal and Vertical Concentric Venting".

INSTALLATION - VENTING

Section B – Vertical 2-Pipe Vent System Installation

B1. This section applies to vertically vented 2-pipe (one combustion air inlet pipe and one vent pipe) vent systems and is in addition to “Section A – General Instructions – All Units”.

B2. Vertical vent systems terminate vertically (up).

B3. It is recommended to install a tee with drip leg and clean out cap as shown in Figure 8.1.

B4. The combustion air and vent pipes must be terminated with (2) listed vent caps.

B5. Vertical vents must terminate a minimum horizontal and vertical distance from roof lines and adjacent walls or obstructions. These minimum distances are outlined in Figure 8.1 and Table 8.1.

B6. The vent must terminate at least 1 foot above and 6 inches horizontally from the combustion air inlet.

Figure 8.1 - Vertical 2-Pipe Vent System - Sloped Roof

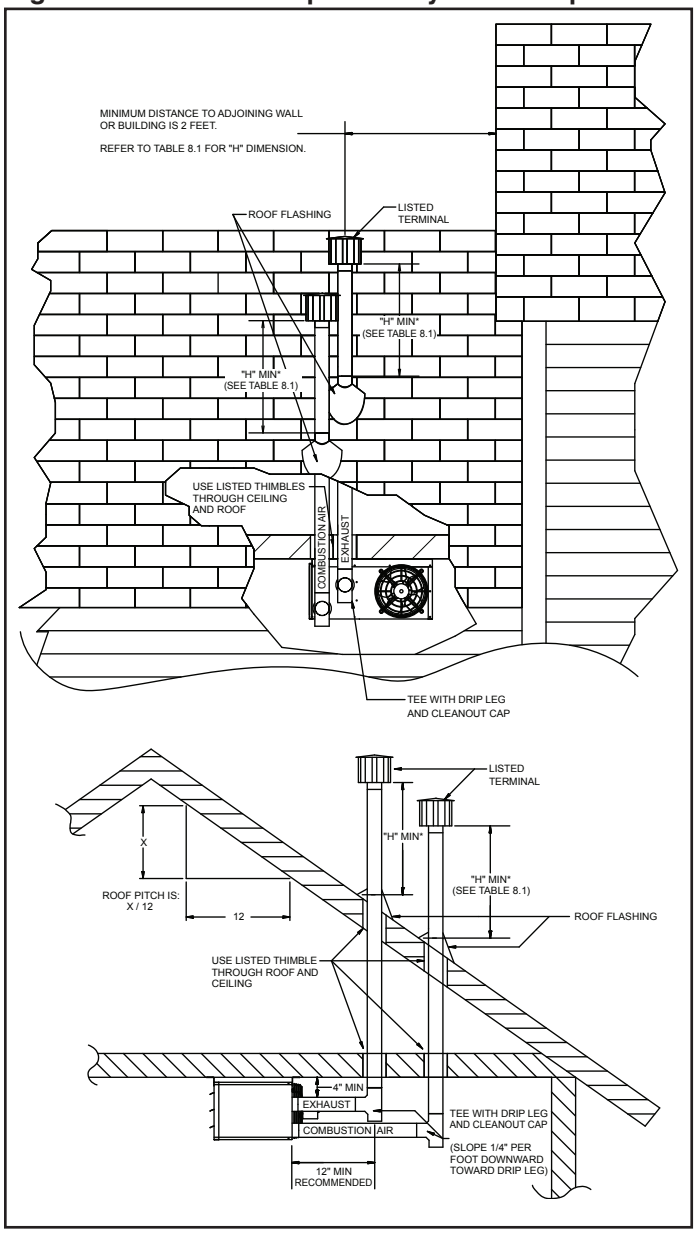
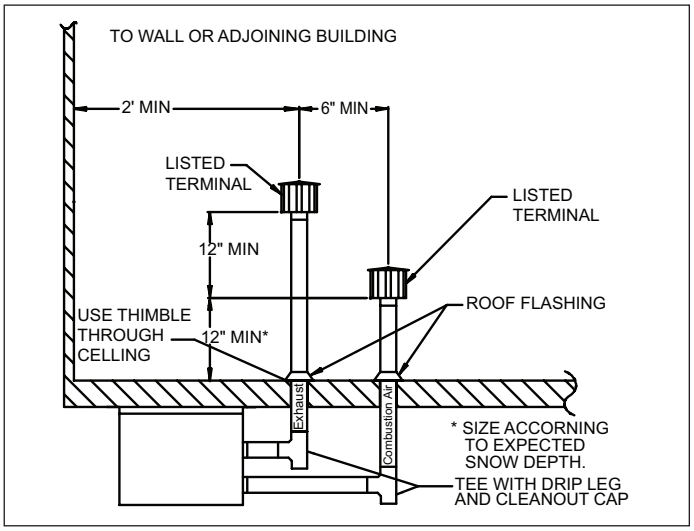

MINIMUM DISTANCE TO ADJOINING WALL OR BUILDING IS 2 FEET.
REFER TO TABLE 8.1 FOR "H" DIMENSION.
ROOF FLASHING
LISTED TERMINAL
"H" MIN* (SEE TABLE 8.1)
"H" MIN* (SEE TABLE 8.1)
USE LISTED THIMBLES THROUGH CEILING AND ROOF
COMBUSTION AIR
EXHAUST
TEE WITH DRIP LEG AND CLEANOUT CAP
LISTED TERMINAL
X
"H" MIN*
"H" MIN* (SEE TABLE 8.1)
ROOF PITCH IS: X / 12
12
ROOF FLASHING
USE LISTED THIMBLE THROUGH ROOF AND CEILING
4" MIN
EXHAUST
COMBUSTION AIR
TEE WITH DRIP LEG AND CLEANOUT CAP
(SLOPE 1/4" PER FOOT DOWNWARD TOWARD DRIP LEG)
12" MIN RECOMMENDED

Table 8.1 - Minimum Height from Roof to Lowest Discharge Opening

Rise X (in)	Roof Pitch	Min Height H (ft) ①
0-6	Flat to 6/12	1.00
6-7	6/12 to 7/12	1.25
7-8	7/12 to 8/12	1.50
8-9	8/12 to 9/12	2.00
9-10	9/12 to 10/12	2.50
10-11	10/12 to 11/12	3.25
11-12	11/12 to 12/12	4.00
12-14	12/12 to 14/12	5.00
14-16	14/12 to 16/12	6.00
16-18	16/12 to 18/12	7.00
18-20	18/12 to 20/12	7.50
20-21	20/12 to 21/12	8.00

① Size according to expected snow depth.

Figure 8.2 - Vertical 2-Pipe Vent System - Flat Roof



B9. Once venting is complete, proceed section titled “Installation – Gas Connections”.

INSTALLATION - VENTING

Section C – Horizontal 2-Pipe Vent System Installation

C1. This section applies to horizontally vented 2-pipe vent systems (one combustion air inlet pipe and one vent pipe) and is in addition to “Section A – General Instructions – All Units”.

C2. Horizontal vent systems terminate horizontally (sideways).

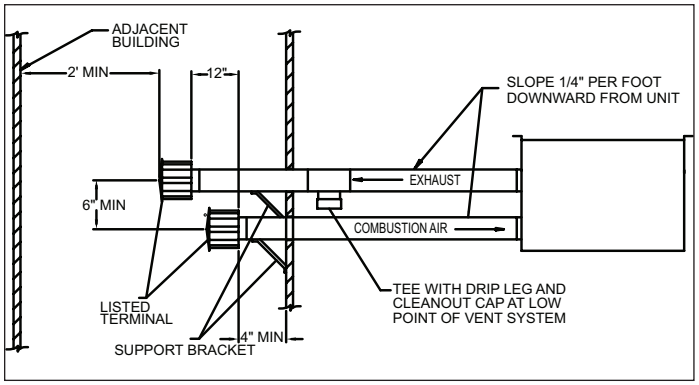
C3. All horizontal vents must be terminated with a listed vent cap. The cap must terminate a minimum distance from the external wall, as summarized in Figure 9.1.

C4. The termination of horizontally vented system must extend 16 inches beyond the exterior surface of an exterior wall.

C5. The combustion air pipe must be a minimum of 6 inches below the vent pipe, and 4 inches from the exterior wall.

C6. Construct the vent system as shown in Figure 9.1.

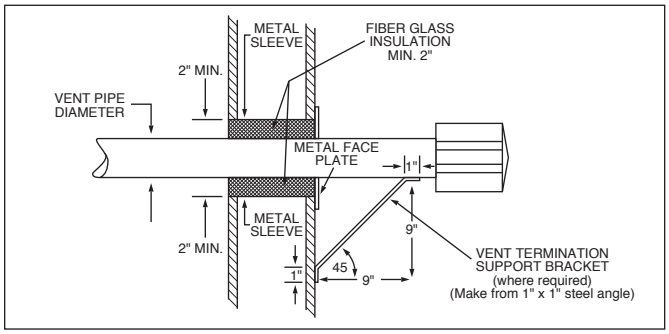
Figure 9.1 - Horizontal Venting with Downward Pitch



C7. When horizontal vents pass through a combustible wall (up to 22 inches thick), the vent passage must be constructed and insulated as shown in Figure 9.2.

C8. The vent must be supported as shown in Figure 9.2.

Figure 9.2 - Exhaust Vent Construction Through Combustible Walls and Support Bracket



C9. When condensation may be a problem, the vent system shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief openings, or other equipment.

C10. Maintain a 1/4" per foot downward slope away from the heater and place a drip leg with clean out near the exit of the vent as shown in Figure 9.1, or allow the condensate to drip out the end.

C11. For a vent termination located under an eave, the distance of the overhang must not exceed 24". The clearance to combustibles above the exterior vent must be maintained at a minimum of 12". Consult the National Fuel Gas Code for additional requirements for eaves that have ventilation openings.

C12. Once venting is complete, proceed section titled “Installation – Gas Connections”.

INSTALLATION - VENTING

Section D – Concentric Vent System Installation

D1. This section applies to both horizontally and vertically vented concentric vent systems as defined in "Section A – General Instructions – All Units", and is in addition to the instructions in that section.

D2. When utilizing the concentric vent option, it should have been predetermined whether the appliance will be horizontally or vertically vented. Before proceeding, verify that the concentric vent kit received contains the correct components for the installation:

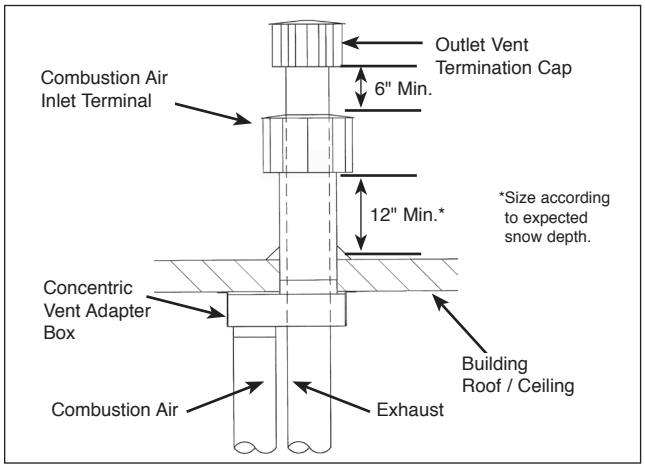
For Vertically Vented Units (Refer to Figure 10.1):

① Concentric adapter assembly (same for horizontal and vertical kits)

② Standard listed vent cap

③ Specially designed inlet terminal (part #5H0751540001)

Figure 10.1 - Vertical Concentric Vent Kit Components



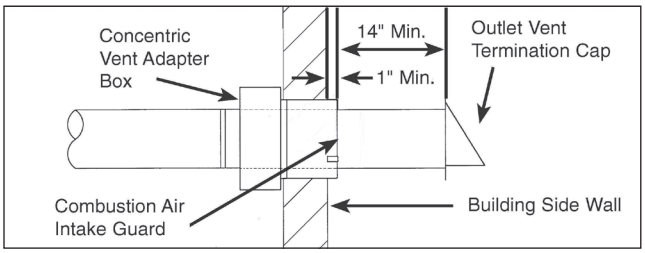
For Horizontally Vented Units (Refer to Figure 10.2):

① Concentric adapter assembly (same for horizontal and vertical kits)

② Special vent termination cap (part #5H0751500001)

③ Special inlet air guard

Figure 10.2 - Horizontal Concentric Vent Kit Components



⚠ CAUTION

The concentric vent adapter box must be installed inside of the structure or building. Do not install this box on the exterior of a building or structure.

D3. Once the kit contents have been verified as correct for the direction of venting, the concentric vent adapter box is to be installed. Determine the location of the box. Be sure to maintain all clearances as listed in these instructions.

D4. The adapter box is to be mounted on the interior side of the building. It must not be mounted outside the building. The adapter box has integral mounting holes for ease of installation.

D5. The adapter box can be mounted flush to the wall (for horizontal kits) or to the ceiling (for vertical kits). The box can also be offset from the wall or ceiling by using field supplied brackets. When mounting the box, consider serviceability and access to the vent and combustion air pipes. If the box is to be mounted using field supplied brackets, these brackets must be strong enough to rigidly secure the box to the wall or ceiling, and should be made from corrosion resistant material.

D6. Determine the length of the vent pipe and combustion air inlet pipe for the selected location. THE VENT PIPE WILL PASS THROUGH THE CONCENTRIC VENT BOX. THE LAST SECTION OF VENT PIPE IS A CONTINUOUS LENGTH OF DOUBLE WALL "B" VENT. See section A12 for attaching and terminating double wall pipe. Begin with pipe lengths on the concentric pipe side of the adapter box referring to Figures 10.1 and 10.2. These pipes will extend through the building wall or roof as well as any added length for the thickness of the wall and the offset from any field installed brackets.

For Vertical Concentric Vent Kits (refer to Figure 10.1):

- The bottom of the combustion air intake pipe must terminate above the snow line, or at least 12 inches above the roof, whichever distance is greater.
- The bottom of the vent cap must terminate at least 6 inches above the top of the combustion air intake cap.

For Horizontal Concentric Vent Kits (refer to Figure 10.2):

- The combustion air intake pipe must terminate at least 1 inch from the wall to prevent water from running down the wall and into the pipe.
- The back of the vent cap must terminate at least 14 inches from the combustion air intake pipe.

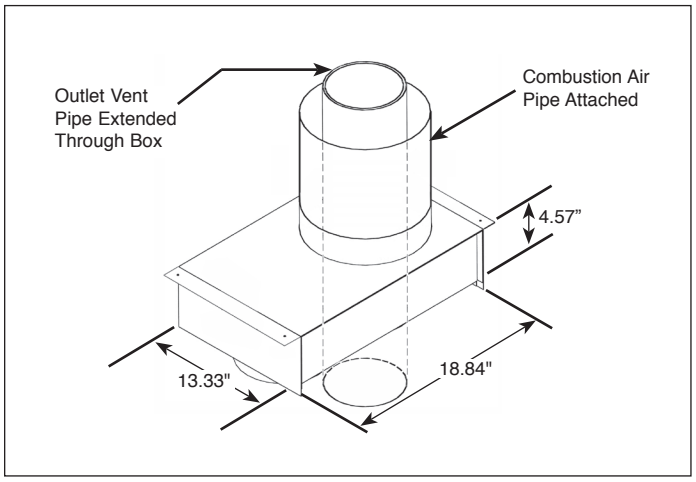
D7. Cut the concentric side vent and combustion air pipes to the proper length as determined in the previous step. See Table 11.1 for Combustion Air and Vent Pipe sizes. The pipes must be single wall galvanized or stainless steel material, except for the last section of vent pipe, which must be one continuous length of double wall B-vent extended through the concentric vent box and combustion air inlet pipe on the concentric side of the box.

D8. Allow the concentric side vent pipe to pass through the concentric vent adapter box, as shown in Figure 11.1. Attach the double wall vent pipe to the single wall vent pipe that goes to the unit. Be sure to seal the joint and the open area around the double wall vent. Seal all joints and seams using sealant suitable for temperatures up to 400°F.

INSTALLATION - VENTING

D9. Slide the combustion air pipe over the vent pipe and attach to the air inlet of the concentric adapter box, as shown in Figure 11.1, using at least 3 corrosion resistant sheet metal screws. Seal the joint and seam using sealant suitable for temperatures up to 400°F.

Figure 11.1 - Adapter Box with Combustion Air Intake Pipe Attached



D10. Place this assembly (the adapter box, vent pipe and combustion air pipe) through the wall or roof and verify that the distance requirements as defined in Step D7 are met. Securely attach the assembly building.

D11. From outside the building, caulk the gap between the combustion air intake pipe and the building penetration.

D12. Attach the combustion air intake and vent pipe terminations as follows:

For Vertical Concentric Vent Kits (refer to Figure 10.1):

- Slide the combustion air cap down over the vent pipe and fasten it to the combustion air pipe with at least 3 corrosion resistant sheet metal screws.
- Attach the vent cap to the vent pipe using at least 3 corrosion resistant sheet metal screws. Refer to instruction A12 for connecting terminal to double wall pipe.
- Caulk the gap between the combustion air cap and the vent pipe with silicone sealant, or other appropriate sealants suitable for metal to metal contact and for temperatures up to 400° F.

For Horizontal Concentric Vent Kits (refer to Figure 10.2):

- Attach the combustion air intake guard using corrosion resistant screws at the end of the combustion air intake pipe to prevent animals and debris from entering.
- Attach the vent cap to the vent pipe using at least 3 corrosion resistant sheet metal screws.

D13. For model sizes 30 and 45, attach the 3" to 4" vent transitions on the non-concentric side vent and combustion air connections using 3 corrosion resistant sheet metal screws.

D14. Install vent pipe and combustion air pipe between unit heater and concentric vent adapter box as outlined in “Section A – General Instructions – All Units”.

D15. Once venting is complete, proceed to the section titled “Installation - Gas Connections”.

Table 11.1 - Concentric Vent Pipe Sizes

	Single Wall Pipe		Type B Vent Pipe ①
Model Size	**Combustion Air (To Unit)**	**Combustion Air (External)**	**Vent (Pass-Through)**
30-45	3" ②	6"	4" ②
60-125	4"	6"	4"

① B-Vent must have 1/4" air gap (OD is 1/2" larger than ID).

② Use included vent transition as described in D13.

INSTALLATION - GAS CONNECTIONS

GAS CONNECTIONS

⚠ WARNING

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equilavent for testing.
2. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).
3. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input, or 5% below the minimum rated input of dual rated units.

⚠ CAUTION

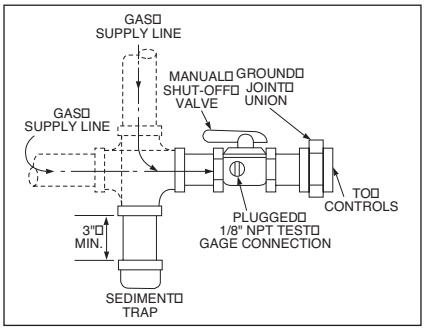
1. Purging of air from gas lines should be performed as described in ANSI Z223.1 - latest edition “National Fuel Gas Code”, or in Canada CSA-B149 codes.
2. When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).
3. The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve.This manual shut-off valve should be located within 6' of the heater.
4. Turn off all gas before installing appliance.

IMPORTANT

To prevent premature heat exchanger failure, the input to the appliance, as indicated on the serial plate, must not exceed the rated input by more than 5%.

1. Installation of piping must conform with local building codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - latest Edition. In Canada, installation must be in accordance with CSA-B149.1.
2. Piping to units should conform with local and national requirements for type and volume of gas handled, and pressure drop allowed in the line.Refer to Table 12.1 to determine the cubic feet per hour (CFH) for the type of gas and size of unit to be installed. Using this CFH value and the length of pipe necessary, determine the pipe diameter from Table 12.2. Where several units are served by the same main, the total capacity, CFH and length of main must be considered. Avoid pipe sizes smaller than 1/2". Table 12.2 allows for a 0.3" W.C. pressure drop in the supply pressure from the building main to the unit. The inlet pressure to the unit must be 6-7" W.C. for natural gas and 11-14" W.C. for propane gas. When sizing the inlet gas pipe diameter, make sure that the unit supply pressure can be met after the 0.3" W.C. has been subtracted. If the 0.3" W.C. pressure drop is too high, refer to the Gas Engineer’s Handbook for other gas pipe capacities.
3. Install a ground joint union with brass seat and a manual shut-off valve adjacent to the unit for emergency shut-off and easy servicing of controls, including a 1/8" NPT plugged tapping accessible for test gauge connection (See Figure 12.1).
4. Provide a sediment trap before each unit in the line where low spots cannot be avoided. (See Figure 12.1).
5. When Pressure/Leak testing, pressures above 14" W.C. (1/2 psi), close the field installed shut-off valve, disconnect the appliance and its combination gas control from the gas supply line, and plug the supply line before testing. When testing pressures 14" W.C. (1/2 psi) or below, close the manual shut-off valve on the appliance before testing.

Figure 12.1 - Recommended Sediment Trap/Manual Shut-off Valve Installation - Side or Bottom Gas Connection ①



① Manual shut-off valve is in the “OFF” position when handle is perpendicular to pipe.

Table 12.1 - Manifold Pressure & Gas Consumption

Model Size	BTU/Cu. Ft. Specific Gravity	Natural 1050 0.60	Propane 2500 1.53	No. of Orifices
Manifold Pressure In. W.C.		**3.5**	**10.0**	
30	CFH	28.6	12.0	2
	Gal/Hr. Propane		.33	
	Sec/cu. ft.	126	300	
	Orifice Drill Size	49	56	
45	CFH	42.9	18.0	3
	Gal/Hr. Propane		.50	
	Sec/cu. ft.	84	200	
	Orifice Drill Size	49	56	
60	CFH	57.1	24.0	4
	Gal/Hr. Propane		.66	
	Sec/cu. ft.	63	150	
	Orifice Drill Size	49	56	
75	CFH	71.4	30.0	5
	Gal/Hr. Propane		.83	
	Sec/cu. ft.	50	180	
	Orifice Drill Size	49	56	
100	CFH	95.2	40	5
	Gal/Hr.Propane		1.09	
	Sec/cu.ft.	38	90	
	Orifice Drill Size	45	55	
125	CFH	119	50	5
	Gal/Hr.Propane		1.37	
	Sec/cu.ft.	30	72	
	Orifice Drill Size	42	53	

Table 12.2 - Gas Pipe Capacities - Natural Gas ① ②

Pipe Length (ft)	Natural Gas					
	1/2”	3/4”	1”	1-1/4”	1-1/2”	2”
10	132	278	520	1050	1600	3050
20	92	190	350	730	1100	2100
30	73	152	285	590	890	1650
40	63	130	245	500	760	1450
50	56	115	215	440	670	1270
60	50	105	195	400	610	1150
70	46	96	180	370	560	1050
80	43	90	170	350	530	930
100	38	79	150	305	460	870
125	34	72	130	275	410	780
150	31	64	120	250	380	710

① Capacities in Cubic Feet per Hour through Schedule 40 pipe with maximum 0.3"W.C. pressure drop with up to 14"W.C. gas pressure. Specific gravity is 0.60 for Natural gas and 1.50 for Propane gas.

② For Pipe Capacity with Propane Gas, divide Natural gas capacity by 1.6. Example: What is the propane gas pipe capacity for 60 feet of 1-1/4" pipe? The Natural gas capacity is 400 CFH. Divide by 1.6 to get 250 CFH for Propane gas.

ELECTRICAL CONNECTIONS

⚠ WARNING

1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
4. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage.

⚠ CAUTION

Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.

All field installed wiring must be done in accordance with the National Electrical Code ANSI/NFPA 70 – latest edition or Canadian Electrical Code CSA C22.1 Part 1 or local codes. Unit must be electrically grounded according to these codes. If any of the original wire supplied with the heater must be replaced, replace it with wiring material having a temperature rating of at least 105°C.

The power to these unit heaters should be protected with a circuit breaker.

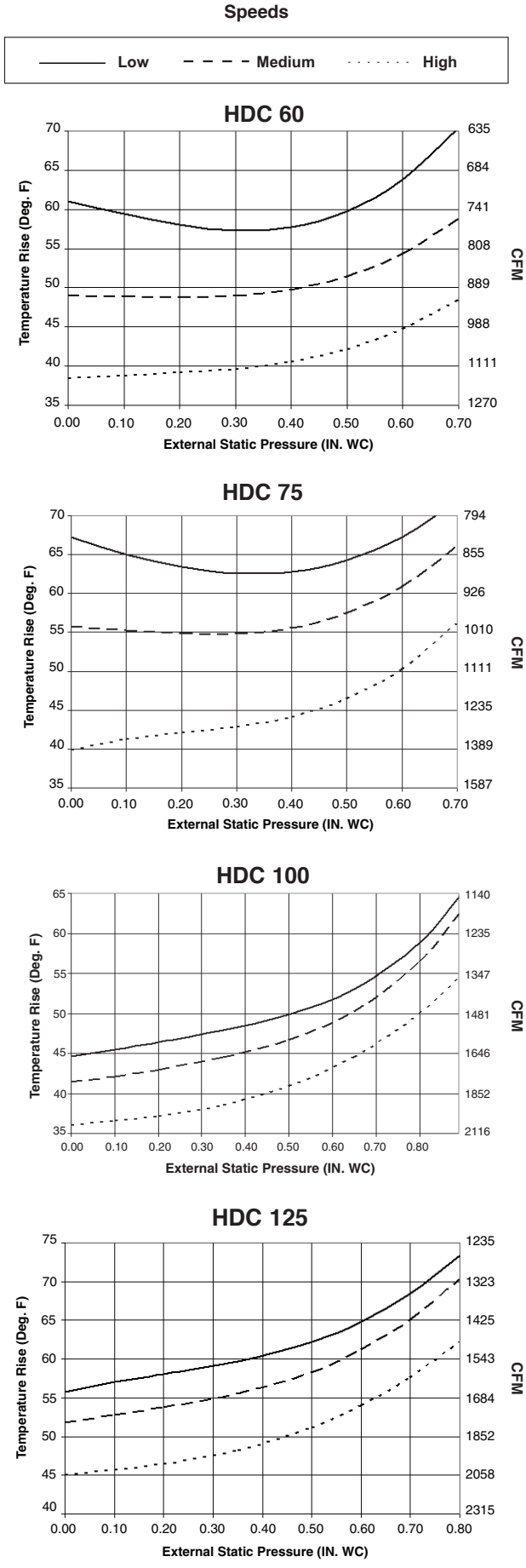
Location of thermostat should be determined by heating requirements and be mounted on an inside wall about 5' above floor level where it will not be affected by heat from the unit or other sources, or drafts from frequently opened doors. See instructions packed with thermostat.

Wiring Adjustments for Blower Motors

The blowers used on Modine HDC units are direct drive and equipped with three speed motors. Air temperature rise of the unit is determined by the speed setting and the amount of static pressure in the system. Units are normally shipped with motors set at high speed. Motor speed is changed by connecting the motor lead for the desired fan speed to the “EAC” or “Blo” terminal of the control board. Unused motor leads for other speeds are placed on the “Park” terminals of the board. See the wiring diagram on page 18.

When applying a blower equipped unit to a duct system or other load, consult the performance curves on this page to determine the air temperature rise for a given motor speed range and static pressure. Verify that the static pressure on the outlet of the unit does not exceed the maximum specified for the unit. If static pressure is too high it must be reduced either by modifications to the system or using the medium or low motor speed. If the unit shuts down on high limit during normal operation, a higher motor speed should be used.

Blower Curve Models (HDC 60-125 Only)



OPERATION

IMPORTANT

1. To prevent premature heat exchanger failure, observe heat exchanger tubes. If the tubes become red while blower and furnace are in operation, check to be sure the blower has been set to the proper rpm for the application. Refer to page 13 for Blower Adjustments.
2. Start-up and adjustment procedures must be performed by a qualified service agency.

Prior to Operation

Although this unit has been assembled and fire-tested at the factory, the following pre-operational procedures should be performed to assure proper on-site operation.

1. Turn off power to the unit at the disconnect switch. Check that fuses or circuit breakers are in place and sized correctly. Turn all hand gas valves to the “OFF” position.
2. Remove the side control access panel.
3. Check that the supply voltage matches the unit supply voltage listed on the Model Identification plate. Verify that all wiring is secure and properly protected. Trace circuits to insure that the unit has been wired according to the wiring diagram.
4. Check to insure that the venting system is installed correctly and free from obstructions. Before you start use the following steps to verify that the venting system is adequately sized:
   a. Seal any unused openings in the venting system.
   b. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code ANSI Z223.1 (NFPA 54) or CSA B149.1 Installation Code-latest edition and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies, which could cause an unsafe condition.
   c. In so far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building. Turn on clothes dryers and any exhaust fans such as range hoods and bathroom exhausts, so they shall operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
   d. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so that the appliance will operate continuously.
   e. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
   f. If improper venting is observed during any of the above tests, the venting system must be corrected.
5. Check to see that there are no obstructions to the intake and discharge of the unit.
6. Check fan clearance. Fan should not contact casing when spun by hand.
7. Check to make sure that all filters are in place and that they are installed properly according to direction of air flow (if applicable).
8. Perform a visual inspection of the unit to make sure no damage has occurred during installation.
9. Check that all horizontal deflector blades are open a minimum of 30° as measured from vertical.
10. Turn on power to the unit at the disconnect switch.
11. Check the thermostat, ignition control, gas valve, and supply fan blower motor for electrical operation. If these do not function, recheck the wiring diagram.
12. Check the blower wheel for proper direction of rotation when compared to the air flow direction arrow on the blower housing (if applicable). Blower wheel rotation, not air movement, must be checked as some air will be delivered through the unit with the blower wheel running backwards.
13. For blower units, check the blower speed (rpm). Refer to Blower Adjustments for modification.
14. Check the motor speed (rpm).
15. Check the motor voltage.
16. Check the motor amp draw to make sure it does not exceed the motor nameplate rating.
17. Recheck the gas supply pressure at the field installed manual shut-off valve. The minimum inlet pressure should be 6" W.C. on natural gas and 11" W.C. on propane gas. The maximum inlet pressure for either gas is 14" W.C. If inlet pressure exceeds 14" W.C., a gas pressure regulator must be added upstream of the combination gas valve.
18. Open the field installed manual gas shut-off valve.
19. Place the manual main gas valve on the combination gas valve in the "On" position. Call for heat with the thermostat.
20. Check to make sure that the main gas valve opens. Check the manifold gas pressure (See Main Gas Adjustment) while the supply fan blower is operating.
21. Check to insure that gas controls sequence properly (See Control Operating Sequence). If you are not familiar with the unit’s controls (i.e. combination gas control), refer to the control manufacturer’s literature supplied with the unit.
22. Once proper operation of the unit has been verified, remove any jumper wires that were required for testing.
24. Replace the side control access panel.

Main Burner Adjustment

The gas pressure regulator (integral to the combination gas control) is adjusted at the factory for average gas conditions. It is important that gas be supplied to the unit heater in accordance with the input rating on the serial plate. Actual input should be checked and necessary adjustments made after the unit heater is installed. Over-firing, a result of too high an input, reduces the life of the appliance and increases maintenance. Under no circumstances should the input exceed that shown on the serial plate.

Measuring the manifold pressure is done at the outlet pressure tap of the gas valve.

To Adjust the Manifold Pressure

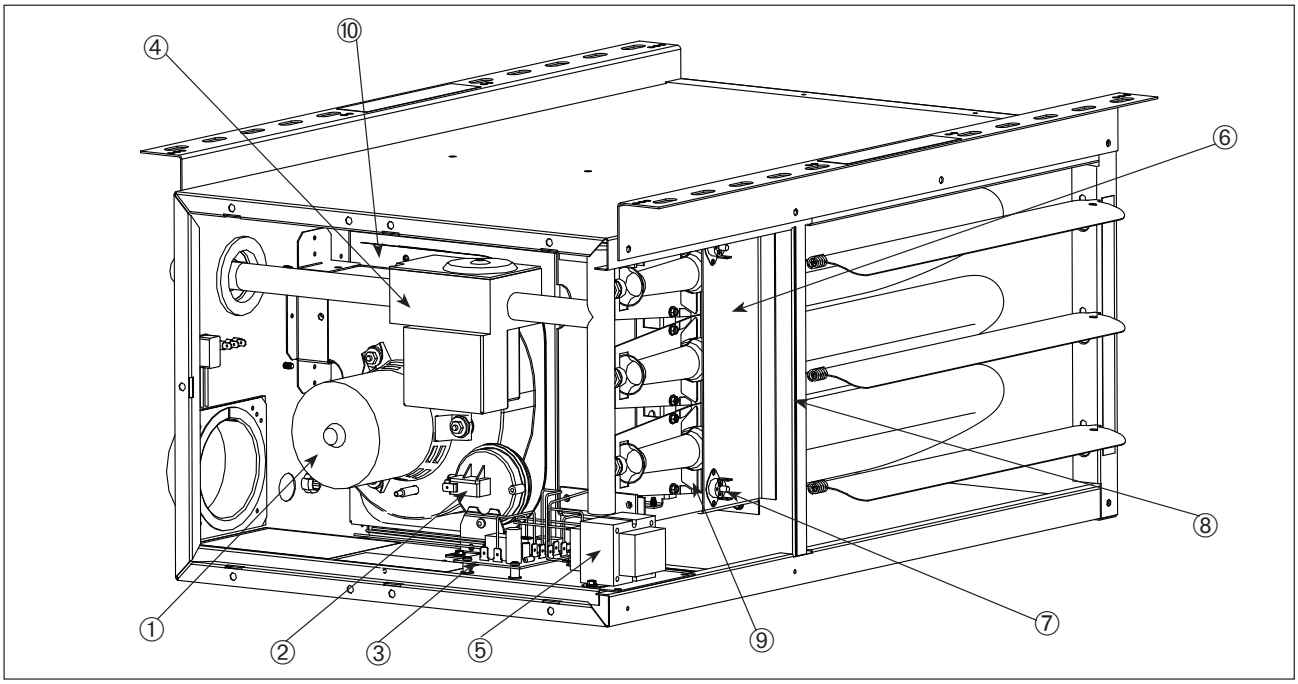
1. Move the field installed manual shut-off valve to the “OFF” position.
2. Remove the 1/8" pipe plug from the outlet pressure tap on the gas valve and attach a water manometer of “U” tube type which is at least 12" high.
3. Move the field installed manual gas shut-off valve to the “ON” position.
4. Create a high-fire call for heat from the thermostat.
5. Refer to Table 12.1 to determine the correct high fire manifold pressure for the gas type of the unit. Adjust the main gas pressure regulator spring to achieve the proper manifold pressure (for location, see the combination gas control literature supplied with unit).
6. After adjustment, move the field installed manual shut-off valve to the “OFF” position and replace the 1/8" pipe plug.
7. After the plug is in place, move the field installed manual shut-off valve to the “ON” position and recheck pipe plugs for gas leaks with soap solution.

CONTROL OPERATING SEQUENCE / UNIT COMPONENTS

CONTROL OPERATING SEQUENCE

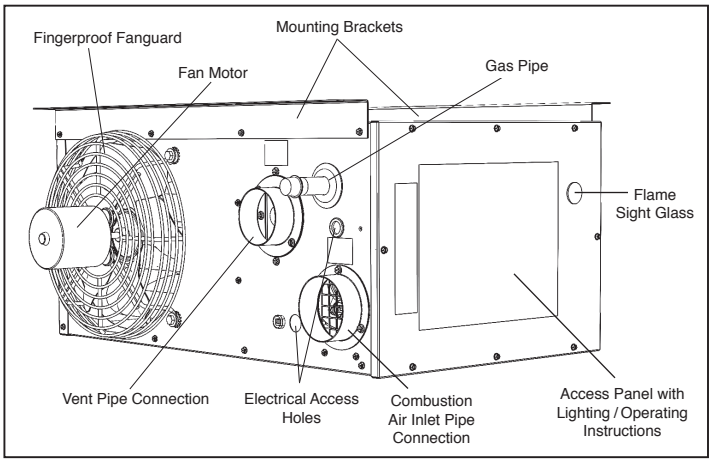
Upon a call for heat from the thermostat, power is supplied to the power exhauster motor. The unit will go through a purge period and then the direct spark igniter will be energized. At the same time, the main valve in the combination control valve will open to allow gas to flow to the burners. If the fan motor has not already started it will start shortly. If a flame is not sensed for any reason the main valve will close and there will be a short purge period before ignition is tried again. If the flame is not sensed after four tries there will be at least a one hour wait before ignition is tried again.

Figure 15.1 - Major Gas, Electrical Service, Safety and Other Components



1. Power Exhauster
2. Pressure Switch
3. Integrated Direct Spark Control Board
4. Combination Gas Control
5. Control Transformer
6. Flame Sensor (hidden)
7. Flame Rollout Switch
8. Auto Reset Limit Control (hidden)
9. Direct Spark Igniter (hidden)
10. Manual Reset Control (hidden, propeller 100-125 only)

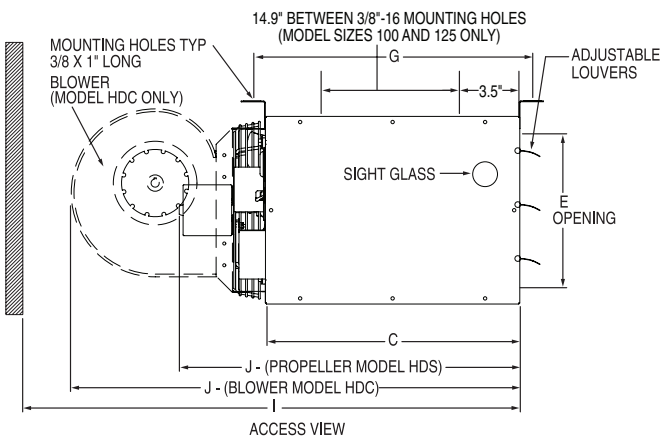
Figure 15.2 - Unit Heater Rear View

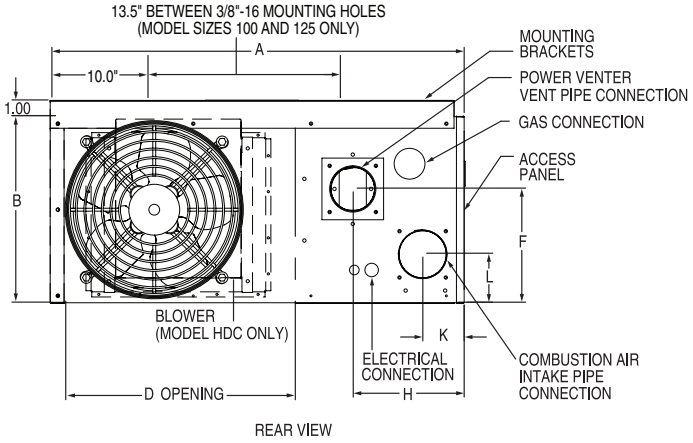


Control Options

Control Description	Control Code No.	Service Voltage	Thermostat Voltage	Type of Gas	Model Size
Single-Stage, Direct Spark Ignition, 100% Shut-Off with Continuous Retry - Utilizes a single-stage combination gas control with ignition control. Gas is lit with a direct spark igniter on call for heat.	11	115V	24V	natural	30-125
	21	115V	24V	propane	30-125
Two-Stage, Direct Spark Ignition, 100% Shut-Off with Continuous Retry - Utilizes a two-stage combination gas control with built-in ignition control. Firing rate is 100% and 50% of full rated input. Gas is lit with a direct spark igniter on call for heat.	12	115V	24V	natural	75-125
	22	115V	24V	propane	75-125

DIMENSIONS / GENERAL PERFORMANCE DATA - HDS/HDC



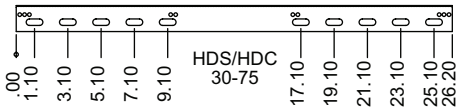


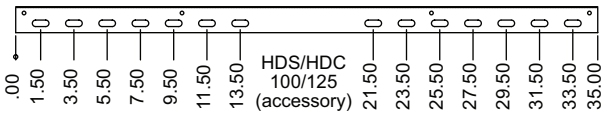
Dimensions (inches)

	Propeller Model Size - HDS					Blower Model Size - HDC		
Dimension	**30**	**45**	**60**	**75**	**100/125**	**60**	**75**	**100/125**
A	26.8	26.8	26.8	26.8	35.5	26.8	26.8	35.5
B	12.2	12.2	18	18	20.5	18	18	20.5
C	16.5	16.5	16.5	16.5	22	16.5	16.5	22
D	14.9	14.9	14.9	14.9	22.5	14.9	14.9	22.5
E	10.1	10.1	15.9	15.9	18.4	15.9	15.9	18.4
F	7.25	7.25	10.75	10.75	14	10.75	10.75	14
G	18.5	18.5	18.5	18.5	–	18.5	18.5	–
H	7.6	7.6	7.835	7.835	8.4	7.835	7.835	8.4
I	34.5	34.5	34.5	34.5	43	35.5	35.5	44.5
J	22	22	25	25	31	32.5	32.5	41.5
K	2.74	2.74	3.15	3.15	3.87	3.15	3.15	3.87
L	3.19	3.19	5.55	5.55	10.73	5.55	5.55	10.73
Vent and Combustion Air Connector Size	3	3	4	4	4	4	4	4
Fan or Blower Diameter	10	10	14	14	18	9 - 7	9 - 7	10 - 10
Approx. Weight (lbs.)	55	60	80	85	125	92	97	125

Mounting Bracket Slot Locations

1" - angle, mounting brackets are slotted to accommodate joists on 16" or 24" centerlines.





Performance

		Propeller Model Size - HDS						Blower Model Size - HDC			
		30	**45**	**60**	**75**	**100**	**125**	**60**	**75**	**100**	**125**
Btu/Hr Input		30,000	45,000	60,000	75,000	100,000	125,000	60,000	75,000	100,000	125,000
Btu/Hr Output		24,000	36,000	48,000	60,000	80,000	100,000	48,000	60,000	80,000	100,000
Entering Airflow (CFM)		505	720	990	1160	1490	1980	635-1111	794-1389	1140-2116	1235-2058
Outlet Velocity (FPM)		523	749	653	769	565	747	437-726	546-908	443-781	488-773
Air Temperature Rise (°F)		44	46	45	48	50	47	40-70	40-70	35-65	45-75
Max. Mounting Height (ft.)		10	10	12	14	12	16	7-13	7-16	8-19	8-17
Heat Throw (ft.)		25	27	36	38	42	56	20-45	24-57	27-68	27-59
Motor Data	**# of Speeds**	1	1	1	1	1	1	3	3	3	3
	Horsepower	1/15	1/15	1/12	1/12	1/12	1/8	1/4	1/3	1/2	1/2
	RPM	1550	1550	1625	1625	1050	1550	Max 1100	Max 1100	Max 1100	Max 1100
	Type	S.P.	S.P.	P.S.C.	P.S.C.	S.P.	P.S.C.	P.S.C.	P.S.C.	P.S.C.	P.S.C.
	Amps	2.4	2.4	1.2	1.2	2.7	2.2	5.4	7.1	9.5	9.5
Total Unit Amps		3.7	3.7	2.5	2.5	4.7	4.2	6.4	8.1	11.5	11.5

SERVICE / MAINTENANCE / TROUBLESHOOTING

⚠ WARNING

When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting the factory. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owner's risk.

⚠ CAUTION

1. Service or repair of this equipment must be performed by a qualified service agency.
2. Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.

To check most of the Possible Remedies in the troubleshooting guide listed in Table 17.1, refer to the applicable sections of the manual.

General Maintenance

The unit and venting system must be checked once a year by a qualified service technician.

All installation and service of these units must be performed by a qualified installation and service agency.

Before any service, BE SURE TO TURN OFF GAS AT THE MANUAL SHUT-OFF VALVE AHEAD OF THE COMBINATION GAS CONTROL AND TURN OFF ALL ELECTRIC POWER TO THE HEATER.

1. Service air moving components annually.
   a. Check fan for fit on motor shaft and for damage to blades.
2. Keep unit free from dust, dirt, grease, and foreign matter, paying particular attention to:
   a. Combustion air inlets.
   b. Burners and burner orifices. Turn off gas ahead of the combination gas control and shut off electric power to the heater. Remove the access panel, open the union on the gas line, and disconnect the igniter and sensor wires. Remove the screws that attach the burner tray to the header plate and remove the burner tray and manifold assembly from the heater. Carefully clean the burners with a wire brush or other suitable means.

   Replace any damaged or deteriorating burners or orifices. Install the burner assembly back on to the header making certain that all screws, pipes and electrical connections are tight.

   CAUTION: Be careful when handling the igniter and flame sensor.
   1. Inspect the flame sensor and igniter for deterioration and/or cracks.
   2. Verify that the burners are touching each other at the carryover points. This will ensure flame carryover from burner to burner.

   c. Clean exterior of heat exchanger tubes.
   d. Fan blade.
3. Check wiring for possible loose connections.
4. Controls – The gas valves and piping should be checked annually for general cleanliness and tightness. The gas controls should be checked to insure that the unit is operating properly. See control instruction sheets furnished separately with the unit heater.
5. Power exhaust assembly/motors – The power exhaust motor bearings have been lubricated for long life and do not require additional lubrication. In dirty atmosphere, it may be desirable to clean the motors and blower housing and blow out the cooling air passages of the motor with compressed air.
6. Perform periodic cleaning of inlet and vent terminal screens.

Table 17.1 - Troubleshooting

TROUBLE	POSSIBLE CAUSE	POSSIBLE REMEDY
Unit does nothing	1. Power supply is off 2. No 24V power to thermostat 3. Thermostat malfunction 4. LED flashes 5. Blown fuse on control board 6. Defective control	1. Turn on main power 2 a. Check control transformer b. If failed transformer - check thermostat wire gage and length 3 a. Verify wire connections to R&W terminals only b. Check / replace thermostat 4. Check LED flash code 5. Replace fuse 6. Replace control
LED light off or flashing	1. Blown fuse on control board 2. Multiple causes	1. Replace fuse 2. Control board LED flash codes vary with control type. A decal is installed in the unit giving a brief description of the applicable codes for your heater. For more detail, see the control board data sheet included with the unit.
Unit starts but does not ignite	1. Main gas is off 2. Air in gas line 3. Main or manifold gas pressure 4. Check gas valve switch	1. Open manual gas valve 2. Purge gas line 3. Set gas pressures per manual instructions 4. Set gas valve switch to "ON" position
Unit goes through cycle but the burners go out in less then 10 seconds	1. Reversed main power polarity 2. Unit not grounded 3. Flame not sensed	1. Black wire - HOT, White wire - NEUTRAL, Green wire - GROUND 2. Ground unit and verify quality of ground connection 3. Check flame sense probe and connection
Air circulating fan inoperable	1. Loose connections 2. Defective control board 3. Defective fan motor	1. Check all connections 2. Check control board data sheet and function 3. Check fan motor

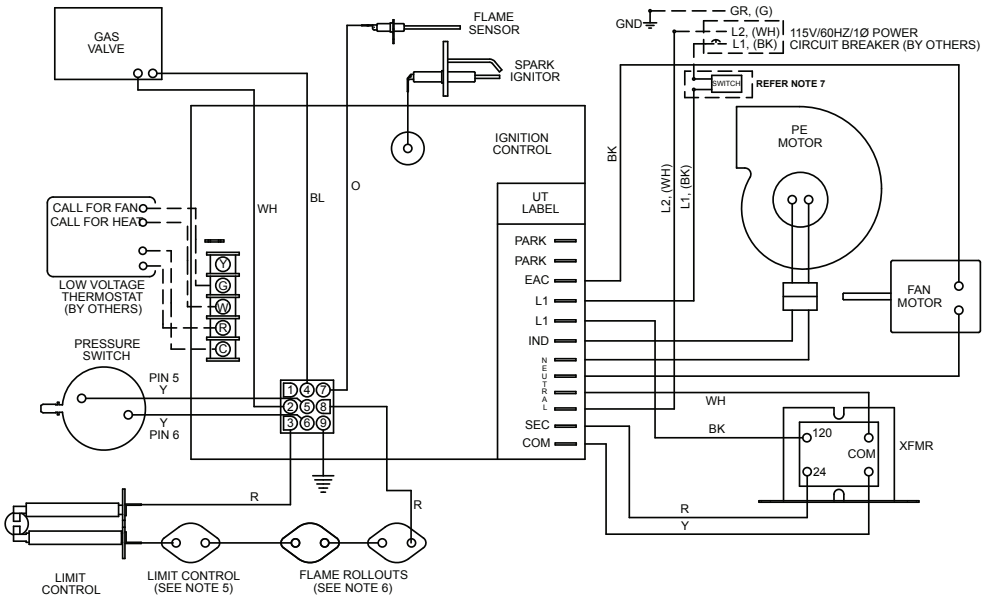
UNIT WIRING

Wiring Diagram Selection

Since internal or factory wiring may vary depending on the controls manufacturer, the wiring diagrams must be appropriately selected with the proper gas valve and ignition type. The following wiring diagram represents a unit equipped with a single stage gas valve, and direct spark ignition.

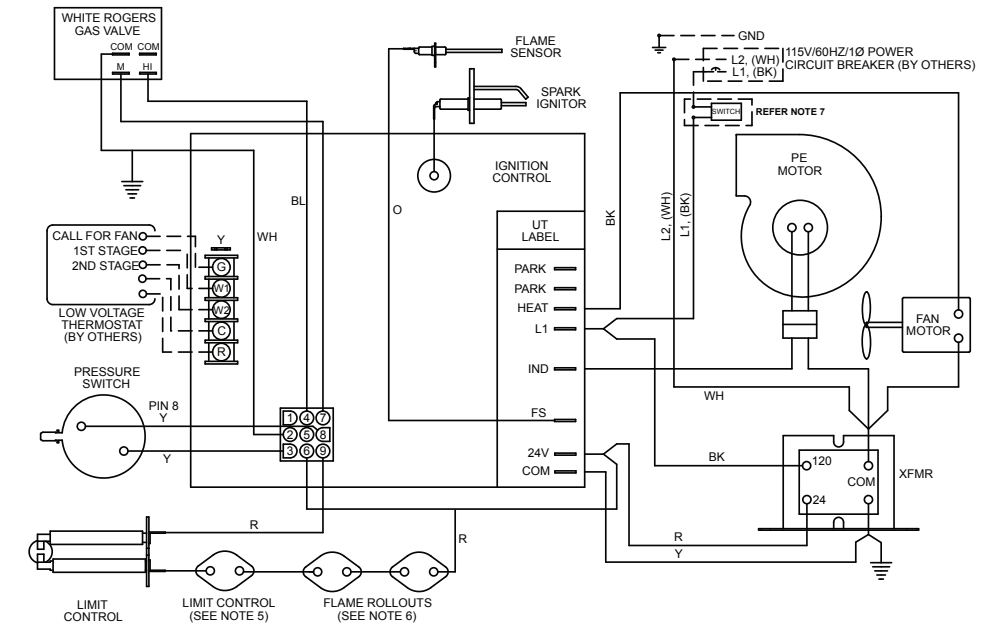
Figure 18.1 - Unit Heater Wiring Diagram (Single and Two Stage, Direct Spark Ignition)

SINGLE STAGE, DIRECT SPARK IGNITION, 100% SHUTOFF, MULTIPLE RETRY W/AUTO RESET FROM LOCKOUT



SINGLE STAGE, DIRECT SPARK IGNITION,
SHUT-OFF, MULTIPLE RETRY W/ AUTO RESET FROM LOCKOUT

TWO STAGE, DIRECT SPARK IGNITION, 100% SHUTOFF, MULTIPLE RETRY W/AUTO RESET FROM LOCKOUT



5H0799630002 REV M
TWO STAGE, DIRECT SPARK IGNITION,
100% SHUT-OFF, MULTIPLE RETRY W/ AUTO RESET FROM LOCKOUT

NOTES TO INSTALLER:

1. ALL WIRING MUST COMPLY WITH NATIONAL ELECTRIC CODE AND ALL LOCAL CODES.
2. ALL COMPONENTS MUST AGREE WITH THEIR RESPECTIVE POWER SOURCE.
3. VERIFY THE POWER SOURCE AND THE UNIT POLARITY.
4. USE TYPE 105°C REPLACEMENT WIRE 300V OR GREATER.
5. USED ON PROPELLER MODELS 100 AND LARGER.
6. TWO SWITCHES: 30-75, ONE SWITCH: 100-125 NOT USED ON 150-400 UNITS.

CAUTION:
FAILURE TO WIRE THIS UNIT ACCORDING TO THIS WIRING DIAGRAM MAY RESULT IN INJURY TO THE INSTALLER OR USER. FOR DEVIATIONS CONTACT THE FACTORY.

MOTOR LEAD COLOR FOR DIRECT DRIVE BLOWER MOTORS ONLY.

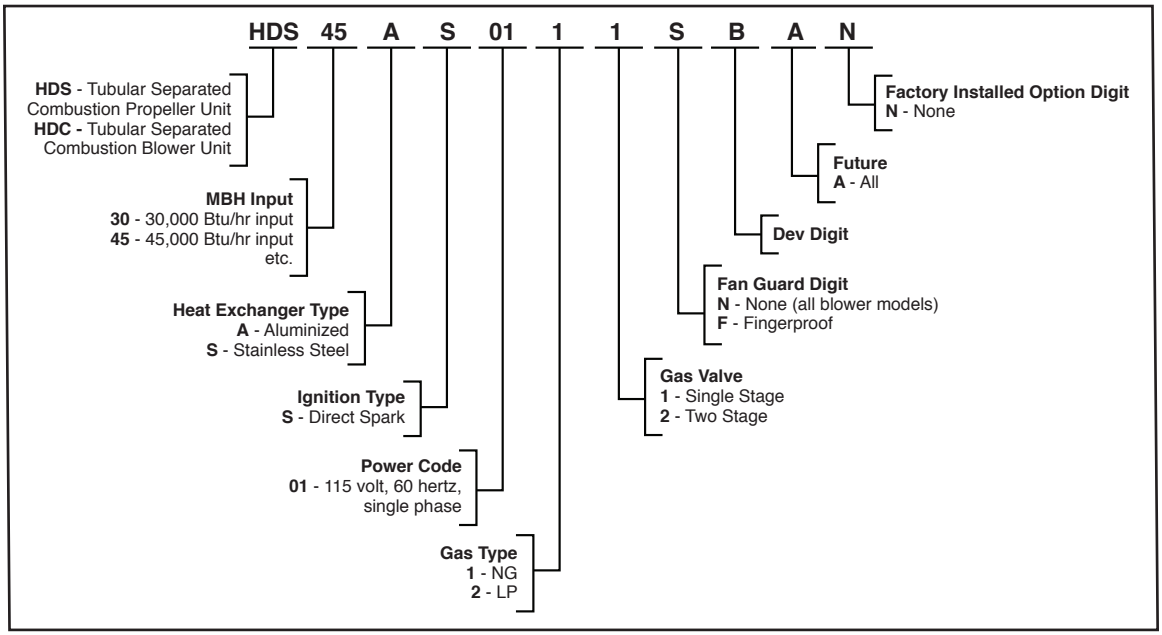
WH - NEUTRAL BL - MED
BK - HI RED - LO

ATTACH WIRES NOT USED TO "PARK" TERMINALS
UNITS ARE FACTORY WIRED FOR HIGH SPEED OPERATION.

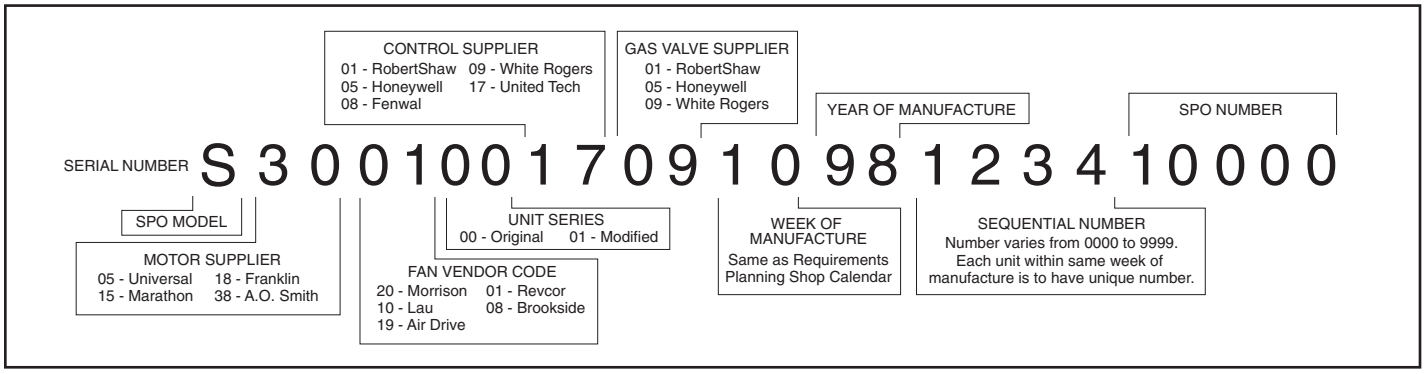
WIRING LEGEND		
FACTORY WIRING INTERNAL COMPONENT WIRING FIELD WIRING WIRE NUT	LINE 24V	◇ INDICATES TERMINAL BOARD CONNECTION

SERIAL & MODEL NUMBER / REPLACEMENT PARTS

Model Number Designations (Remove access cover to locate)



Serial Number Designations (Remove access cover to locate)


CONTROL SUPPLIER
01 - RobertShaw 09 - White Rogers
05 - Honeywell 17 - United Tech
08 - Fenwal
GAS VALVE SUPPLIER
01 - RobertShaw
05 - Honeywell
09 - White Rogers
YEAR OF MANUFACTURE
SPO NUMBER
SERIAL NUMBER S 3 0 0 1 0 0 1 7 0 9 1 0 9 8 1 2 3 4 1 0 0 0 0
SPO MODEL
MOTOR SUPPLIER
05 - Universal 18 - Franklin
15 - Marathon 38 - A.O. Smith
UNIT SERIES
00 - Original 01 - Modified
FAN VENDOR CODE
20 - Morrison 01 - Revcor
10 - Lau 08 - Brookside
19 - Air Drive
WEEK OF MANUFACTURE
Same as Requirements Planning Shop Calendar
SEQUENTIAL NUMBER
Number varies from 0000 to 9999. Each unit within same week of manufacture is to have unique number.

Replacement Parts

When requesting parts please contact your local representative. Please have full model and serial number available. If you require assistance in locating your representative, please call the number located on the back page.

Figure 19.1 - Common Replacement Parts (The list is subject to change. Please refer to unit mounted parts list for most up-to-date list.)

Model Size	Power Exhauster	Limit Control Switch	Flame Roll-out Switch	Trans-former	Pressure Switch	Igniter	Ignition Control (1 Stage)	Combination Gas Valve (1 Stage)		Ignition Control (2 Stage)	Combination Gas Valve (2 Stage)	
								Code 11	Code 21		Code 12	Code 22
HDS 30	5H79402	5H75769-1	5H75002-7	5H75029	5H79441-1	5H79636	5H79749	5H79751	5H79869	NA	NA	NA
HDS 45	5H79402	5H75769-1	5H75002-7	5H75029	5H79441-2	5H79636	5H79749	5H79751	5H79869	NA	NA	NA
HDS 60	5H79402	5H75769-2	5H75002-7	5H75029	5H79441-3	5H79636	5H79749	5H79751	5H79869	NA	NA	NA
HDC 60	5H79402	5H75769-4	5H75002-7	5H75029	5H79441-3	5H79636	5H79749	5H79751	5H79869	NA	NA	NA
HDS 75	5H79402	5H75769-2	5H75002-7	5H75029	5H79441-3	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871
HDC 75	5H79402	5H75769-2	5H75002-7	5H75029	5H79441-3	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871
HDS 100	5H79795	5H75769-2	5H75002-4	5H75029	5H79441-9	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871
HDC 100	5H79795	5H75769-3	5H75002-4	5H75029	5H79441-9	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871
HDS 125	5H79795	5H75769-1	5H75002-4	5H75029	5H79441-9	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871
HDC 125	5H79795	5H75769-2	5H75002-4	5H75029	5H79441-9	5H79636	5H79749	5H79751	5H79869	5H79804	5H79748	5H79871

COMMERCIAL WARRANTY

Seller warrants its products to be free from defects in material and workmanship, EXCLUSIVE, HOWEVER, of failures attributable to the use of materials substituted under emergency conditions for materials normally employed. This warranty covers replacement of any parts furnished from the factory of Seller, but does not cover labor of any kind and materials not furnished by Seller, or any charges for any such labor or materials, whether such labor, materials or charges thereon are due to replacement of parts, adjustments, repairs, or any other work done. This warranty does not apply to any equipment which shall have been repaired or altered outside the factory of Seller in any way so as, in the judgment of Seller, to affect its stability, nor which has been subjected to misuse, negligence, or operating conditions in excess of those for which such equipment was designed. This warranty does not cover the effects of physical or chemical properties of water or steam or other liquids or gases used in the equipment.

BUYER AGREES THAT SELLER'S WARRANTY OF ITS PRODUCTS TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP, AS LIMITED HEREIN, SHALL BE IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, WHETHER ARISING FROM LAW, COURSE OF DEALING, USAGE OF TRADE, OR OTHERWISE, **THERE ARE NO OTHER WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, WHICH EXTEND BEYOND THE PRODUCT DESCRIPTION CONFIRMED BY BUYER AND SELLER AS OF THE DATE OF FINAL AGREEMENT.**

This warranty is void if the input to the product exceeds the rated input as indicated on the product serial plate by more than 5% on gas-fired and oil-fired units, or if the product in the judgment of SELLER has been installed in a corrosive atmosphere, or subjected to corrosive fluids or gases, been subjected to misuse, negligence, accident, excessive thermal shock, excessive humidity, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to SELLER'S printed instructions, or if the serial number has been altered, defaced or removed.

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF SELLER, ANY COMPONENT WHICH SHALL, WITHIN THE APPLICABLE WARRANTY PERIOD DEFINED HEREIN AND UPON PRIOR WRITTEN APPROVAL, BE RETURNED TO SELLER WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF SELLER SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM SELLER. FOR GAS-FIRED PRODUCTS INSTALLED IN HIGH HUMIDITY APPLICATIONS AND UTILIZING STAINLESS STEEL HEAT EXCHANGERS, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO TEN YEARS FROM DATE OF SHIPMENT FROM SELLER.

These warranties are issued only to the original owner-user and cannot be transferred or assigned. No provision is made in these warranties for any labor allowance or field labor participation. Seller will not honor any expenses incurred in its behalf with regard to repairs to any of Seller's products. No credit shall be issued for any defective part returned without proper written authorization (including, but not limited to, model number, serial number, date of failure, etc.) and freight prepaid.

OPTIONAL SUPPLEMENTAL WARRANTY

Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years on certain compressors. Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years or nine (9) years on certain heat exchangers.

EXCLUSION OF CONSUMABLES & CONDITIONS BEYOND SELLER'S CONTROL

The above referenced warranty shall not be applicable to any of the following items: refrigerant gas, belts, filters, fuses and other items consumed or worn out by normal wear and tear or conditions beyond Seller's control, including (without limitation as to generality) polluted or contaminated or foreign matter contained in the air or water utilized for heat exchanger (condenser) cooling or if the failure of the part is caused by improper air or water supply, or improper or incorrect sizing of power supply.

Component Applicable Models	**"APPLICABLE WARRANTY PERIOD"**
Heat Exchangers Gas-Fired Units	TEN YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN ONE HUNDRED TWENTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
Heat Exchangers Low Intensity Infrared Units **Compressors** Condensing Units for Cassettes	FIVE YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN SIXTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
Burners Low Intensity Infrared Units **Other** Components excluding Heat Exchangers, Coils, Condensers, Burners, Sheet Metal	TWO YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TWO YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN THIRTY MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
Heat Exchangers/Coils Indoor and Outdoor Duct Furnaces and System Units, Steam/Hot Water Units, Oil-Fired Units, Electric Units, Cassettes, Vertical Unit Ventilators, Ventilators, Geothermal Units **Compressors** Vertical Unit Ventilators, Ventilators, Geothermal Units **Burners** High Intensity Infrared Units **Sheet Metal Parts** All Products	ONE YEAR FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN ONE YEAR FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN EIGHTEEN MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST

Commercial Products Group
Modine Manufacturing Company
1500 DeKoven Avenue
Racine, WI 53403
Phone: 1.800.828.4328 (HEAT)
www.modinehvac.com

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